GARMIN Ltd. or its subsidiaries
c/o Garmin International
1200 E. 151st Street, Olathe, KS 66062 USA

FAA APPROVED
ROTORCRAFT FLIGHT MANUAL SUPPLEMENT

GARMIN 400W SERIES GPS-WAAS NAVIGATION SYSTEM

As Installed In

Bell 206B

Reg. No. _____ S/N _____

This document serves as a Rotorcraft Flight Manual Supplement when the rotorcraft is equipped with the Garmin 400W Series unit. This document must be carried in the rotorcraft at all times when the Garmin 400W Series unit is installed in accordance with STC SR02080SE.

The information contained herein supplements or supersedes the information made available to the operator by the manufacturer in the form of clearly stated placards, markings, or manuals or in the form of an FAA approved Rotorcraft Flight Manual, only in those areas listed herein. For limitations, procedures and performance information not contained in this document, consult the basic placards, markings, or manuals or the basic FAA approved Rotorcraft Flight Manual.

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for _____
Manager, Flight Test Branch
Federal Aviation Administration
Seattle Aircraft Certification Office

DATE: 9/27/10

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Bell 206B

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Section 1. LIMITATIONS

1.1 Pilot's Guide

The GARMIN 400W Series Pilot's Guide, part number and revision listed below (or later revisions), must be immediately available for the flight crew whenever navigation is predicated on the use of the 400W Series unit.

- 400W Series Pilot's Guide & Ref P/N 190-00356-00 Rev G
- 400W/500W Series Optional Displays P/N 190-00356-30 Rev H

This model helicopter when equipped with the G400W is limited to VFR ONLY operations in accordance with 14 Code of Federal Regulations Part 91 and Part 135. The placard listed below shall be located in close proximity to the 400W Series unit.

"APPROVED FOR DAY/NIGHT VFR".

1.2 System Software:

The system must utilize the Main and GPS software versions listed below (or later FAA approved versions for this STC). The software versions are displayed on the self-test page immediately after turn-on for approximately 5 seconds or they can be accessed in the AUX pages.

Subsequent software versions may support different functions. Check the 400W Series Pilot's Guide for further information.

Table 1 - Approved Software Versions

Software Item	**Approved Software Version** *(or later FAA approved versions for this STC)*	
	SW version	As displayed on unit
Main SW Version	4.01	4.01
GPS SW Version	3.2	3.2

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1.3 Navigation Database

The 400W Series unit database cards must be installed and current. The software automatically precludes invalid databases for use by the 400W. Database cycle information is displayed at power up on the screen, but more detailed information is available on the AUX – UTILITY page.

a) Installations with dual 400W/500W Series units will only crossfill between units when they contain the same database cycle. Updating of each database must be accomplished on the ground prior to flight.

1.4 Terrain Database

The 400W Series unit supports Terrain Proximity or HTAWS and requires a Terrain database card to be installed in order for the feature to operate. Database cycle information is displayed at power up on the screen, but more detailed information is available on the AUX – UTILITY page. Terrain database cards contain the following data:

a) Due to the terrain resolution used in this system, the terrain database is divided into six regions [Americas North; Americas South; Atlantic North; Atlantic South; Pacific North; Pacific South]. Use of the proper database region must be verified.

b) The Obstacle Database has an area of coverage that includes the United States and Europe, and is updated as frequently as every 56 days.

NOTE:

The area of coverage may be modified as additional terrain data sources become available.

1.5 Navigation

No navigation is authorized north of 89° (degrees) north latitude or south of 89° (degrees) south latitude.

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1.6 Terrain Proximity Display [Units without HTAWS]

Terrain Proximity refers to the display of terrain information and comprises of a 2-D picture of the surrounding terrain and obstacles relative to the position and altitude of the rotorcraft, however it does not provide any alerts.

Navigation must not be predicated upon the use of the terrain display. The terrain display is intended to serve as a situational awareness tool only. By itself, it may not provide either the accuracy or the fidelity on which to base decisions and plan maneuvers to avoid terrain or obstacles.

Terrain is not depicted on the terrain display within 1nm of airports and heliports, however terrain hazards may exist in these areas.

1.7 HTAWS Function [Units with HTAWS]

HTAWS is an optional extension of Terrain Proximity. Pilots are authorized to deviate from their current ATC clearance to the extent necessary to comply with HTAWS warnings.

HTAWS shall NOT be used for navigation purposes.

HTAWS is an alerting system. The system does NOT guarantee successful recovery from a conflict due to factors such as pilot response, aircraft performance, and database limitations. No standardized recovery technique is defined as recovery maneuvers may vary.

HTAWS functions performed by the Garmin 400W Series navigator are inhibited below 30 knots groundspeed.

Display of the terrain and obstacles is supplemental data only. Maneuvering solely by reference to the terrain and obstacle display is not authorized.

NOTE:

The Terrain and Obstacle Display is intended to serve as a terrain and obstacle awareness tool only. The Display and database may not provide the accuracy or fidelity on which to base routine navigation decisions and plan routes to avoid terrain or obstacles.

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The Obstacle Database does not contain the location of power line poles or wires. Also the Obstacle Database contains only KNOWN obstacles and does not contain ALL existing obstacles.

When alerting is inhibited, all Forward Looking Terrain Alerting aural and visual alerting is suppressed. HTAWS should be only inhibited when in visual contact with terrain and when the pilot can be assured of maintaining clearance from terrain and obstacles.

1.8 HTAWS Annunciations on the PFD [Units with HTAWS]

HTAWS (Terrain Awareness and Warning System) visual annunciations from the GNS 400W series unit are displayed on the G500H PFD. The required HTAWS annunciations appear in the upper right of the PFD. These annunciations include TERRAIN (red), TERRAIN (yellow), OBSTACLE (red), OBSTACLE (yellow), HTAWS N/A (yellow), HTAWS INHB (white). These annunciations are not relative to the terrain elevation information displayed on the G500H MFD.

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Section 2. EMERGENCY PROCEDURES

2.1 Emergency Procedures

No change.

2.2 Abnormal Procedures

a) If the Garmin 400W Series unit GPS navigation information is not available, or is invalid, utilize other remaining operational navigation equipment installed in the aircraft as appropriate. If the 400W Series unit loses GPS position and reverts to Dead Reckoning mode (indicated by the annunciation of "DR" in the lower left of the display), the moving map will continue to be displayed. Rotorcraft position will be based upon the last valid GPS position and estimated by Dead Reckoning methods. Changes in airspeed or winds aloft can affect the estimated position substantially. Dead Reckoning is only available in Enroute and Oceanic mode; Terminal and Approach modes do not support DR.

b) If a "Loss of Integrity" (INTEG) message is displayed during:

- Enroute/Terminal: continue to navigate using GPS equipment and periodically cross-check the GPS guidance to other approved means of navigation.

c) When a Terrain or Obstacle Awareness CAUTION occurs, verify the aircraft flight path and correct it, if required.

d) When a Terrain or Obstacle Awareness WARNING occurs, immediately initiate a maneuver that will provide maximum terrain or obstacle clearance, until all alerts cease.

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Section 3. NORMAL PROCEDURES

Refer to the 400W Series unit Pilot's Guide defined in paragraph 1.1 of this document for normal operating procedures. This includes all GPS operations, VHF COM and NAV, and Multi-Function Display information.

Although intuitive and user friendly the 400W Series unit requires a reasonable degree of familiarity to enable unit operations without becoming too engrossed at the expense of basic see-and-avoid. Pilot workload will be higher for pilots with limited familiarity in using the unit. Garmin provides training tools with the Pilot's Guide and PC based simulator. Pilots should take full advantage of these training tools to enhance system familiarization.

3.1 Approaches with Vertical Guidance

The 400W Series unit supports three types of GPS approaches with vertical guidance: LPV approaches, LNAV/VNAV (annunciated as L/VNAV) approaches, and LNAV approaches with advisory vertical guidance (annunciated as LNAV+V). For LNAV approaches with advisory vertical guidance, the 400W Series will annunciate LNAV+V indicating vertical guidance is available. LNAV minimums will be controlling in this case.

3.2 WFDE Prediction Program

The Garmin WAAS Fault Detection and Exclusion (WFDE) Prediction Program is required for Remote/Oceanic operations. The Prediction Program should be used in conjunction with the Garmin 400W/500W Simulator. After entering the intended route of flight in the Simulator flight plan the pilot selects the FDE Prediction Program under the Options menu of the Simulator program.

For detailed information refer to the WFDE prediction program instructions (190-00643-01). The availability of FDE is only required for Oceanic or Remote operations.

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3.3 HTAWS Controls

The HTAWS function has control options on the HTAWS Page using the MENU key. The options are activated by highlighting the desired option and pressing ENTER.

The "Inhibit HTAWS?" menu selection is used to inhibit HTAWS alerts. When alerting is inhibited, all HTAWS aural and visual alerting is suppressed. HTAWS should be only inhibited when in visual contact with terrain and when the pilot can be assured of maintaining clearance from terrain and obstacles. Use the "Enable HTAWS?" to un-inhibit the unit.

The "Mute Active Caution?" menu selection is used to mute an HTAWS caution that is presently active. When the caution is resolved, the next caution will be heard. It does not mute warnings, only cautions. The "Unmute Active Caution?" is used to cancel the mute. An optional "MUTE" external switch installation on the cyclic stick is allowed to mute the caution that is presently active in the same manner as using the Page Menu selection.

The "Reduce Protection?" menu selection is used to activate the Reduce Protection (RP) functionality. RP Mode reduces alerting thresholds and suppresses aural and visual cautions to allow operation in closer proximity to terrain and obstacles while continuing to provide protection from terrain and obstacles. The "Enable Full Protection?" menu selection is used to select full protection functionality again. An optional "RP MODE" external switch installation on the cyclic stick is allowed to toggle Reduce Protection and Enable Full Protection in the same manner as using the Page Menu selection.

The "Test HTAWS?" menu selection is used to activate a manual test which verifies proper operation of the aural and visual annunciations of the system. The aural message "HTAWS System Test, OK" is played if the system passes the test, if the system fails the test "HTAWS System Failure" is played. HTAWS test is only available while on the ground.

Voice callouts (VCOs) provide voice annunciation of the aircraft height above terrain when that threshold is crossed. VCOs may be enabled by the pilot in 100ft increments from 500 feet above ground level to the surface. Enabling VCOs is accomplished using Voice Callout selection in the AUX pages.

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3.4 HTAWS Alerts

HTAWS visual and aural alerts provided by the Garmin 400W Series GPS/WAAS Navigator are shown in the table
below.

HTAWS Annunciation	Pop-Up Alert	Aural Message	Description
TAWS FAIL	None	"HTAWS System Failure"	HTAWS has failed
TAWS INHB	None	None	HTAWS has been inhibited by the crew, or the aircraft groundspeed has fallen below 30 knots (automatic inhibiting).
TAWS N/A	None	"HTAWS Not Available"	HTAWS not available.
TERRAIN	CAUTION - TERRAIN	"Caution - Terrain, Terrain"	Forward Looking Terrain Avoidance Caution for Terrain
TERRAIN	WARNING - TERRAIN	"Warning - Terrain, Terrain"	Forward Looking Terrain Avoidance Warning for Terrain
OBSTACLE	CAUTION - OBSTACLE	"Caution - Obstacle, Obstacle"	Forward Looking Terrain Avoidance Caution for Obstacle
OBSTACLE	WARNING - OBSTACLE	"Warning - Obstacle, Obstacle"	Forward Looking Terrain Avoidance Warning for Obstacle
RP MODE	None	None	Alerting thresholds are reduced. Visual and aural annunciation of caution alerts are suppressed.
None	None	"Five Hundred" "Four Hundred" "Three Hundred" "Two Hundred" "One Hundred"	HTAWS provides optional 500 ft through 100 ft (in 100 ft increments) altitude call out alerts.

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3.5 G500H Interface

The GNS 400W series unit is interfaced to the G500H display system for the purpose of displaying HTAWS annunciations in the pilot's primary field of view. Terrain and obstacle alerts are provided by the GNS 400W series unit. The alerting mode for G500H Terrain Helicopter Synthetic Vision Technology (HSVT) will be driven by the HTAWS mode selected on the GNS 400W series unit. In the event of a failure of the GNS unit providing HTAWS functionality, the HSVT Terrain alerting may be available and the alerting mode can be selected by the pilot on the G500H terrain page.

Section 4. PERFORMANCE

No change.

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GENERAL

Garmin 400W Series GPS/WAAS Nav Com

The Garmin 400W Series GPS/WAAS Navigator is a panel-mounted product that contains a GPS/WAAS receiver for GPS approved primary navigation under TSO C146a, (plus optional VHF Com, VHF Nav radios and HTAWS) in an integrated unit with a moving map and color display. The 400W Series unit features a graphical display.

The navigation functions are operated by dedicated keys and graphical menus which are controlled by the buttons and the dual concentric rotary knob along the bottom and right side of the display.

Optional VHF Com and VHF Nav radio functions are controlled via dedicated buttons and knobs on the left side of the display and adjacent to frequencies they are controlling.

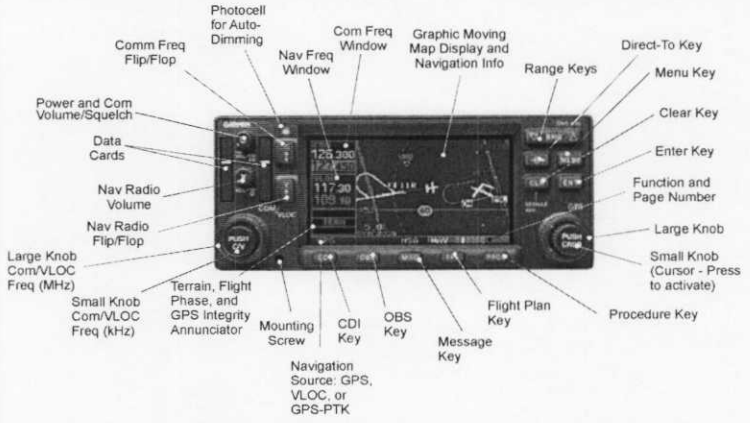

Figure 1 - 400W Series Control and Display Layout

Optional HTAWS functions are controlled by soft keys located on the dedicated TAWS page. An installation option allows some of the controls to be installed on the cyclic grip.

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Operation

GPS/WAAS TSO-C146a Class 3 Operation: The Garmin 400W Series unit uses GPS and WAAS (within the coverage of a Space-Based Augmentation System complying with ICAO Annex 10) for enroute, terminal area, non-precision approach operations (including "GPS", "or GPS", and "RNAV" approaches), and approach procedures with vertical guidance (including "LNAV/VNAV" and "LPV").

Navigation is accomplished using the WGS-84 (NAD-83) coordinate reference datum. GPS navigation data is based upon use of only the Global Positioning System (GPS) operated by the United States of America.

Class II Oceanic, Remote, and other Operations

The Garmin 400W Series, as installed, has been found to comply with the requirements for GPS primary means of Class II navigation in oceanic and remote airspace, when used in conjunction with WAAS Garmin Prediction Program part number 006-A0154-03. Oceanic operations are supported when the 400W Series unit annunciates OCN. This provides an alarm limit of four NMI and a mask angle of five degrees. The 400W series unit also has the ability to predict RAIM availability at any waypoint in the database or if WAAS corrections are expected to be absent or disabled. This RFMS does not constitute an operational approval for Oceanic or Remote area operations. Additional equipment installations or operational approvals may be required.

a) Oceanic navigation requires an additional approved long range oceanic and/or remote area navigation system with independent display, sensors, antenna, and power source. (It may be a second 400W/500W Series unit.)

b) Redundant VHF Com and VHF Nav systems may be required for other than U.S. 14 CFR Part 91 operations. Check foreign regulation requirements as applicable. (It may be a second 400W/500W Series unit.)

c) Operations approval *may* be granted for the use of the 400W Series unit RAIM prediction function in lieu of the Prediction Program for operators requiring this capability. Refer to your appropriate civil aviation authorities for these authorizations.

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